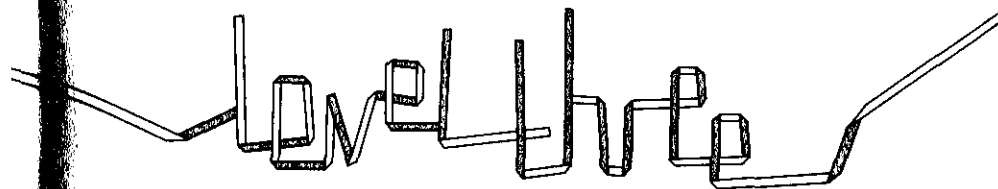


ming quietly. Their expression belies a common state of mind—a play state.

How that play state manifests in the brain, and why games possess such a magic hold over us, are mysteries we need to understand if we want to harness their power.



Want to feel good? Have a cupcake. That first bite will quickly trigger the release of opioids in the pleasure center of your brain. You'll feel a deep satisfaction and all will be right with the world, at least for a little while. This process is largely the same for many of our favorite rewards, including shopping, chocolate, and orgasms.

But what if you want to feel *motivated*? Well, that all depends on what you're trying to do. Video games, as you know by now, are remarkably good at encouraging people to do all kinds of things. Playing games, at least from your brain's perspective, seems like very important work indeed. This is not surprising, since a game usually comprises a series of little challenges and struggles, all designed to push you to the edge of your abilities, shift you into flow, and reward you when you succeed. But why is the structure of a game so attractive to your brain? What's really going on there?

To find out, let's quickly brush up on our neuroscience. The human brain is made up of a vast and dense network of special nerve cells called neurons. Neurons use electrical and chemical signals known as neurotransmitters to communicate with each other through junctions called synapses. Your brain contains approximately 80 to 100 billion neurons that are constantly communicating with each other by releasing and reclaiming

these chemical signals. There are many different kinds of neurotransmitters in the brain, and they regulate a wide variety of processes, including those that regulate the motivation we feel while playing games.

What Drives Us

To truly understand the brain chemistry involved in gameplay (or cupcakes for that matter), we need to understand the neurological difference between *pleasure* and *desire*. From a neuroscientist's perspective, these are two very different things.

Kent Berridge of the University of Michigan is an expert in affective neuroscience and studies pleasure in the brain. He uses the terms *liking* and *wanting* to describe the processes behind pleasure and desire.

According to Berridge, there are certain hedonic hotspots located in a small part of the brain known as the nucleus accumbens. When we receive a reward, opioids and other brain chemicals are released to these hotspots and interact with the neurons there to, in Berridge's words, "generate a 'liking' reaction—a sort of pleasure gloss or varnish." Experiences that are pleasurable trigger this pleasure circuitry, which in turn tells us, "Hey, that really hits the spot." Liking, then, in Berridge's terms, is another word for pleasure.

Wanting, on the other hand, is primarily fueled by the neurotransmitter dopamine. Once thought to be the brain's primary pleasure drug, dopamine is now understood to be much more active in regulating desire and motivation. According to Steven Johnson in *Everything Bad Is Good for You*, "The dopamine system is a kind of accountant: keeping track of expected rewards, and sending off an alert—in the form of lowered dopamine levels—when those rewards don't arrive as promised."

When we don't find what we're looking for, lowered dopamine levels trigger that wanting sensation—and an invigorated search for the reward we're craving. Seeking, a concept originated by Washington State University neuroscientist Jaak Panksepp, is

synonymous with wanting. Panksepp uses the term to describe an emotional state of "eagerness and directed purpose."

This concept of seeking in the brain was developed by Panksepp over the course of several decades spent researching emotional systems in mammals. Essentially, seeking represents our will to act; it explains our most innate drive—that is, the will to wake up every morning and forage for survival.

This instinct is not irreversible. In studies where dopamine neurons are destroyed, starving lab rats presented with food won't even take two steps to eat it, because their wanting system—their motivational circuitry—is no longer functioning. Provided that the rats' pleasure and consummatory pathways are still intact though, these same immobilized rodents *will eat* if food is placed directly in their mouths.

Wanting and liking form a kind of symbiotic loop of motivation and satisfaction. Wanting drives us to pursue the object of our desire. Once we get it, our liking circuits, and the consummatory acts that stimulate them, inhibit our need to seek. This state of satisfaction and calm lasts until these inhibitors wear off, and then we start all over again.

Built to Play

If there's a pattern to the rewards or surprises we encounter, our brain quickly recognizes it. Each time something good happens, neurons in our reward circuitry fire. Over time, though, a special group of prediction neurons start firing at the first sign that a reward is coming. This is the reason Pavlov's dog would salivate at the sound of a bell—his brain knew that a treat was on its way. The more these neurons fire together—the more repeatable the pattern—the more their synapses are strengthened. As they say, neurons that fire together wire together.

This hunt for patterns explains much about the gamer mindset, our Internet addiction, and flow. There is some evidence to suggest that our internal sense of time is also controlled by dopamine, which would explain why flow activities (including

playing games) can create the illusion of time flying or standing still.

Rather than thinking of our brain as particularly responsive to play, we might be better off thinking of it as *built for play*. With this in mind, it's not surprising that Panksepp believes the instinct to play actually originates in the human brain stem—the source of our most basic functions. Scientists at Monash University have shown a correlation between brain size and playfulness in mammals: the bigger the brain, the bigger the player. Our massive brain may make us the most playful species of all.

The human brain is an unbelievably complex system that, for all our probing, still retains many mysteries. Even one small area, like the basal ganglia (which plays host to most of the phenomena we discussed here), operates through a tangled web of excitatory, inhibitory, and disinhibitory pathways across half a dozen functional parts. This stuff is anything but simple.

The functional arrangement of billions of neurons in our brains isn't necessarily elegant, but it is breathtakingly effective. And that's simply because our wetware wasn't designed—it evolved in a world that rewards organisms who learn quickly and regularly. To learn, we must venture out to explore and probe the world around us. To motivate that exploration, our brain encourages play.

Play Is a State of Mind

It's tempting to think about play as something we *do*. But play is more elusive than that; it can't be observed as a behavior without some understanding of the participants. For everyone but their owners, two dogs playing vigorously might be indistinguishable from those same dogs fighting. Or put in terms of our own species, when a chef cooks something new, it feels like play. When I cook something new, it feels like work. Both of us are making a meal, but we're not experiencing the same thing. *Play is a state of mind.*

Interestingly, we can come to an activity emotionally ready to

play, but an activity also has the ability to prompt a play state in us. For example, try playing dodgeball with your co-workers and remaining even-tempered and unexcited. As students of human behavior, the notion that an activity or stimulus can trigger our natural play response is important, and we'll come back to it later.

Playing with Patterns

Play gives us a chance to hone what we do best (and what we most enjoy): noticing, deciphering, and mastering patterns. It has been suggested by Jeff Hawkins (the founder of Palm), among others, that human intelligence is really nothing more than an extremely sophisticated pattern recognition engine.

In the context of play, that makes an awful lot of sense. Nothing seems to be more satisfying than figuring things out—grokking the rules of any system. In any playful activity, the participant is asking himself, "What must I overcome to achieve my objective?"

Play Is Learning

When we play against obstacles, we make an assumption about what might work, and then test our hypothesis. In this way, all play is an active hunt for a pattern—a hands-on way to train our brains. The uncertainty, resistance, and difficulty we face in different kinds of play create a unique kind of tension. And it's this force that pushes back against our desires and forces us to figure out a way to succeed.

Tension permeates the experience of "probing," a concept that has been discussed by professor James Paul Gee (an expert on games and learning) and Steven Johnson. Probing is simply the act of exploring an environment or phenomenon we don't understand in an orderly way. Gee's account of the probing process, in which he describes players hypothesizing about and testing their virtual environments, sounds incredibly similar to the process we employ in scientific research. Could it be that play is simply

an emotionally charged expression of the scientific method? If so, then probing is our most natural learning mechanism.

Gee and other scholars have been making this assertion about game-based learning for years. In talking about the connection between fun, play, and learning he remarks, "When learning stops, fun stops, and playing eventually stops. For humans, real learning is always associated with pleasure, is ultimately a form of play—a principle almost always dismissed by schools." Play isn't a way to make learning fun . . . play is learning.

Play Is Misunderstood

At some point in our past, we drew a line between work and play as if they were somehow exclusive concepts. Work is productive, play is frivolous. This may have been an important message when scolding factory workers during the Industrial Revolution, but it's an inaccurate and counterproductive message today amidst the Digital Revolution. Let me contradict a couple centuries of wisdom with a thought of my own: *play is an abundant energy source that powers all human potential*. To tap into it, we need to define it, understand it, and respect it—all difficult activities in a culture that has relegated it to playgrounds and idle hands.

Defining Play

The study of play has a rich recent history, but prior to Johan Huizinga, no one had explored it thoroughly. Huizinga was a Dutch historian and cultural theorist who wrote the seminal book on play in culture entitled *Homo Ludens* (translation: playing man) in 1938. He opens the book with a wake-up call about the nature of play: "Play is older than culture, for culture, however inadequately defined, always presupposes human society, and animals have not waited for man to teach them their playing."

Even though we've all seen animals at play, it's easy to get caught up in the idea that play is a somehow uniquely human

experience. Those who haven't observed it carefully may even assume that play is a recent development in our evolution, the result of free time that would be better spent on serious endeavors (mirroring our cultural view on play). Huizinga reminds us though, that play is bigger and older than we think it is.

If play is indeed an ancient and abstract concept, then how might we define it? Huizinga's definition is the most widely cited on the subject. Although many experts have since added their two cents, it's a great starting point for understanding play:

Summing up the formal characteristic of play, we might call it a free activity standing quite consciously outside "ordinary" life as being "not serious" but at the same time absorbing the player intensely and utterly. It is an activity connected with no material interest, and no profit can be gained by it. It proceeds within its own proper boundaries of time and space according to fixed rules and in an orderly manner. It promotes the formation of social groupings that tend to surround themselves with secrecy and to stress the difference from the common world by disguise or other means.

Huizinga's definition is quite focused on the meaning of play in specific (and human) terms. A more abstract definition from two modern experts on games and play comes from game designers and authors Katie Salen and Eric Zimmerman: "Play is the free space of movement within a more rigid structure." This elegantly frames the concept of play far more broadly, and indeed, works in almost any context. Whether we play with a toy, the guitar, or even a board game, we're embodying this more open-ended definition of the term.

While both of these definitions make sense, it is Huizinga's notion that play occurs outside ordinary life that is crucial to understanding the magic of play. He later describes it as "a stepping out of 'real' life into a temporary sphere of activity with a disposition all its own." It seems Mr. Rogers was right—the Land of Make Believe is where it's at.

Putting the Fun in Play

Not surprisingly, play is fun. And fun is powerful. We all want to have it. If you think back to the best moments of your life, they will almost uniformly be defined by fun. Your first year away from home in the college dorm. Your most recent vacation. Those first few days (and nights) with a new love interest. These experiences are all defined by an intense feeling of enjoyment and elation. Yet fun is surprisingly difficult to describe.

While we all know it when we see it, fun remains ambiguous. In *Homo Ludens*, Huizinga points out that there may not be a truly equivalent word in any other language. So, we're left with limited clarity on the nature of fun, but we do know this: fun is essential.

Or is it? Thinking back to Psychology 101, there's no mention of fun in Abraham Maslow's famous hierarchy of human needs. His landmark paper "A Theory of Human Motivation" outlined five levels of need, progressing in order of sophistication: physiological, safety, love/belonging, esteem, and self-actualization. Accepting Maslow's theory for a second, we should consider why fun might be absent from his list. Perhaps fun isn't a need at all.

Instead, we should consider fun as a means rather than an end. If that's the case, then we should be able to have fun in a wide range of circumstances. We most certainly can. In fact, we need to. Dale Carnegie, in *How to Win Friends and Influence People*, says it all, "People rarely succeed at anything unless they have fun in what they are doing." Of course, it's easier to have fun on a Caribbean vacation than in prison, but fun is not conditional to our circumstance. It can and will occur anywhere.

Fun Is Nature's Reward

Evolutionary psychology tells us that having fun increases our chances of survival. In attempting to explain the joy of being

chased in sports like football or tag, Boston College Professor Peter Gray recalls the work of Karl Groos, a naturalist, who wrote *The Play of Animals* in 1898. Groos posited that young mammals who engage in games of chase derive great joy from the activity because repeated games of chase will *prepare them for fleeing from predators*.

Gray suggests that since humans may have evolved in situations where fleeing was necessary, sports like basketball, football, and hockey mimic this same dynamic. In these games a single player transporting a ball or puck attempts to avoid a horde of "enemies" in order to score. So, according to Groos, *fun is nature's reward for practicing survival skills*. That makes having fun seem a lot less trivial.

Fun Can Be Hard

As play becomes harder and more intense (especially in the case of modern video games), the fun we experience feels different. In 1989 a small boy playing with LEGOs during a research session at the MIT Media Lab coined the term "hard fun" to describe the way he felt in constructing a complicated structure. Seymour Papert and others at the lab later popularized the term.

Hard fun suggests the distinction between fun as pleasure (a roller coaster ride), and fun as enjoyment (building a beautiful sand castle), in which the latter is clearly the hard fun. Hard fun has the potential to be infinitely more rewarding, and is the by-product of a well-designed game.

What Now?

A lot of what makes us human is hardwired. Our brains, like neurological Venus flytraps, will spring into action if we stimulate them in the right way. I find myself constantly wondering: what would it take to trigger the people around me, and get them to play along? If we can motivate millions *inside* games, could we get them to do other, more positive things in the "real